

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

DSP5018 – STATISTICS AND PROBABILITY

(*for diploma students only*)

3 MARCH 2018

02.30 pm – 4.30 pm

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write your answers in the answer booklet provided.
4. Key formulae are given in the Appendix.

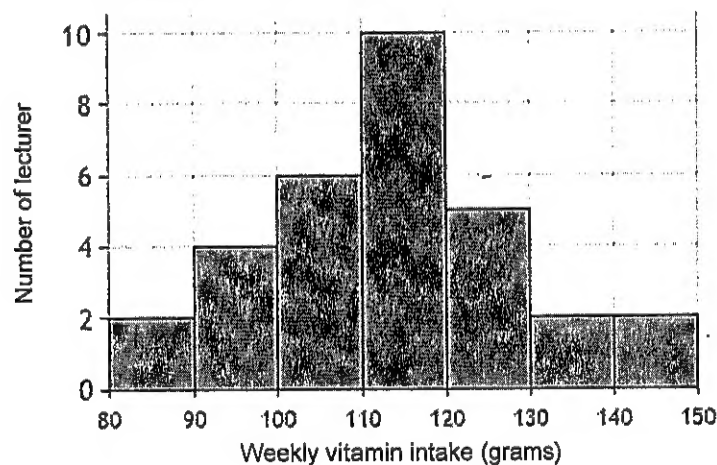
Question 1

- a) The following stem and leave diagram shows the marks obtained in Business Mathematics final exam by a group of 20 students.

| STEM | LEAF |
|------|-----------------|
| 3 | 4 9 |
| 4 | 3 |
| 5 | 4 |
| 6 | 7 |
| 7 | 0 5 6 |
| 8 | 1 2 4 5 6 8 9 9 |
| 9 | 0 6 6 9 |

Key: 7|0 means 70

- Based on the diagram, list down the 5 number summary of the distribution. (6.5 marks)
 - Calculate the interquartile range, and identify the lower and upper limit of the distribution. (3 marks)
 - Identify any outliers and draw a boxplot to represent the above data. (4 marks)
- b) Result of a study on 31 lecturers in MMU Melaka regarding their weekly intake of vitamins, in grams, are shown in the following histogram.



Continued...

- i) Reconstruct and complete the grouped data table below based on the data in the histogram. (6 marks)

| Class/Vitamin Intake (grams) | Frequency | Relative frequency | Midpoint |
|------------------------------|-----------|--------------------|----------|
| 80≤90 | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Total | | | |

- ii) From table in part (i), calculate the standard deviation of the weekly intake of vitamin. Give your answer in four decimal places. (5.5 marks)

[TOTAL 25 MARKS]

Question 2

- a) A group of students study the behavior of customers at a fast food restaurant. As it turns out, 60% of their business operation is via the drive-through window (D), and 40% is via counter-service (C). Data from the registers reveal that 70% of the transactions at the drive-through are via credit/debit cards (M), while 80% of the transactions at the counter are via credit/debit cards and the other transactions are via cash (N).
- Construct a tree diagram to represent the above information. (3 marks)
 - What is the probability of a random customer to make order via drive-through and uses credit card? (2 marks)
 - What is the probability that a random transaction uses cash? (3 marks)
- b) In a group of 50 people waiting at a bus stop one morning, 30 people had an umbrella, 20 people had a raincoat and 12 people had both an umbrella and a raincoat.
- Draw a Venn diagram to represent the above information, using " U " for the event "has an umbrella" and " R " for the event "has a raincoat". (3 marks)
 - If a person was randomly picked from the bus stop, what is the probability that the person had a raincoat only? (1 mark)
 - Are the event U and R mutually exclusive? Explain your answer. (2 marks)

Continued...

- c) The table below shows the results of a survey regarding how MMU students get to the campus each day.

| | Male | Female | TOTAL |
|--------|------|--------|-------|
| Car | 8 | v | 11 |
| Others | w | 5 | x |
| TOTAL | y | z | 23 |

- i) Complete the table by finding the values of v , w , x , y and z . (5 marks)
 ii) If one student is chosen at random, find the probability to choose a male student, given that he gets to MMU campus by car. (3 marks)
 iii) If a student gets to MMU campus by bus, find the probability that the student is a female student. (3 marks)

[TOTAL 25 MARKS]

Question 3

| | Uber Rental | Grab Rental |
|---------------------------|-------------|-------------|
| Sample mean | RM 35 | RM 40 |
| Sample standard deviation | RM 17.50 | RM 23.50 |

- a) The table above shows the survey of 100 respondents for each car rental services in Melaka area. It is claimed that there is a difference in the average price between Uber Rental and Grab Rental. At 10% significance level, can we conclude that the claim is true? (10 marks)
- b) According to Mekdi Food & Restaurants, it was reported that more than 85% of students bought the Prosperity Burger during Chinese New Year. A random sample of 250 students was selected and 217 claimed that they bought the Prosperity Burger. Test at 10% of significance level whether to reject or accept the claim. (11 marks)
- c) For each of the following statements, write (T) for a true statement and (F) for a false statement. (4 marks)
- Hypothesis testing is one of the methods commonly used for making decisions or judgments.
 - A hypothesis test involves two hypotheses; the null hypothesis and the alternative hypothesis.
 - There are two possible choices for the alternative hypothesis.
 - A hypothesis test is called a one-tailed test if it is either left tailed or right tailed.

[TOTAL 25 MARKS]

Continued...

Question 4

Malaysian Youth Club organizes a street collection for a mental health charity. The location takes place in a large city on a particular Sunday. 10 volunteers each holding donation box, stand in busy places and ask passers-by for donations. The table below shows the time they spent together, x minutes, and the collection amounts, y , to the nearest RM.

| Collector | A | B | C | D | E | F | G | H | I | J |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| x | 45 | 60 | 75 | 90 | 110 | 65 | 85 | 100 | 120 | 140 |
| y | 120 | 320 | 280 | 300 | 288 | 150 | 170 | 295 | 410 | 385 |

- Given $\sum y^2 = 822894$, $\sum x^2 = 86900$, $\sum xy = 261080$. Compute the value of SS_{xx} , SS_{yy} and SS_{xy} . (3 marks)
- Calculate the correlation coefficient, r and interpret the answer. (3 marks)
- Compute the regression equation $\hat{y} = \beta_0 + \beta_1 x$. (4 marks)
- Find the sum of squares of SST , SSR and SSE . (3 marks)
- Calculate the standard error of the estimate, s_e . (2 marks)
- At 5% significance level, do the data provide sufficient evidence to conclude that time is useful as predictor of amount? (8 marks)
- Predict the amount of donations collected by volunteers in 160 minutes. (2 marks)

[TOTAL 25 MARKS]

End of page.

APPENDIX – KEY FORMULA

| | Ungrouped Data | Grouped Data |
|-----------------|--|--|
| Mean | $\bar{x} = \frac{\sum x_i}{n}$ where n : sample size | $\bar{x} = \frac{\sum m_i f_i}{\sum f_i}$ where m : class midpoint f : class frequency |
| Variance | $s^2 = \frac{1}{n-1} \left[\sum x_i^2 - \frac{(\sum x_i)^2}{n} \right]$ where n : sample size | $s^2 = \frac{1}{(\sum f_i) - 1} \left[\sum m_i^2 f_i - \frac{(\sum m_i f_i)^2}{\sum f_i} \right]$ where m : class midpoint f : class frequency |

NORMAL AND STANDARD NORMAL PROBABILITY DISTRIBUTION

- z-value (observed value) for an x value : $Z = \frac{x - \mu}{\sigma}$

HYPOTHESIS TESTING

| Population | Mean | Proportion |
|------------|--|--|
| 1 | $Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$ | $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \text{ where } \hat{p} = \frac{x}{n}$ |
| 2 | $Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$ | $Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\hat{p}_p(1-\hat{p}_p)} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ <p>where $\hat{p}_p = \frac{x_1 + x_2}{n_1 + n_2}$</p> |

Continued...

LINEAR REGRESSION ANALYSIS

- Least square regression equation, $\hat{y} = \beta_0 + \beta_1 x$ where $\beta_1 = \frac{S_{xy}}{S_{xx}}$ and $\beta_0 = \bar{y} - \beta_1 \bar{x}$
- Correlation coefficient, $r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}}$ where

| | | |
|--|--|---|
| $S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$ | $S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n}$ | $S_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n}$ |
|--|--|---|

- Sum of Square

| | | |
|-------------------|----------------|-----------------------------------|
| $SST = SSR + SSE$ | $SST = S_{yy}$ | $SSR = \frac{(S_{xy})^2}{S_{xx}}$ |
|-------------------|----------------|-----------------------------------|

- Test of Significance for Regression Slope

| | | |
|--|--|--|
| Standard Error, $s_e = \sqrt{\frac{SSE}{n-2}}$ | Regression t-Test $t = \frac{\beta_1}{s_e / \sqrt{S_{xx}}}$ | Correlation t-Test $t = r \cdot \sqrt{\frac{n-2}{1-r^2}}$ |
|--|--|--|

End of page.

